



Maximizing the Service Life of Dense Graded Asphalt Mixes

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OUTLINE

Evolution/History

Perceived Underperformance of Superpave Mixes

Task Force Developed to Initiate Potential Research

ARAC Supports Phased Process

Results from Phase I

Modified Phase II

Phase III

EVOLUTION/HISTORY

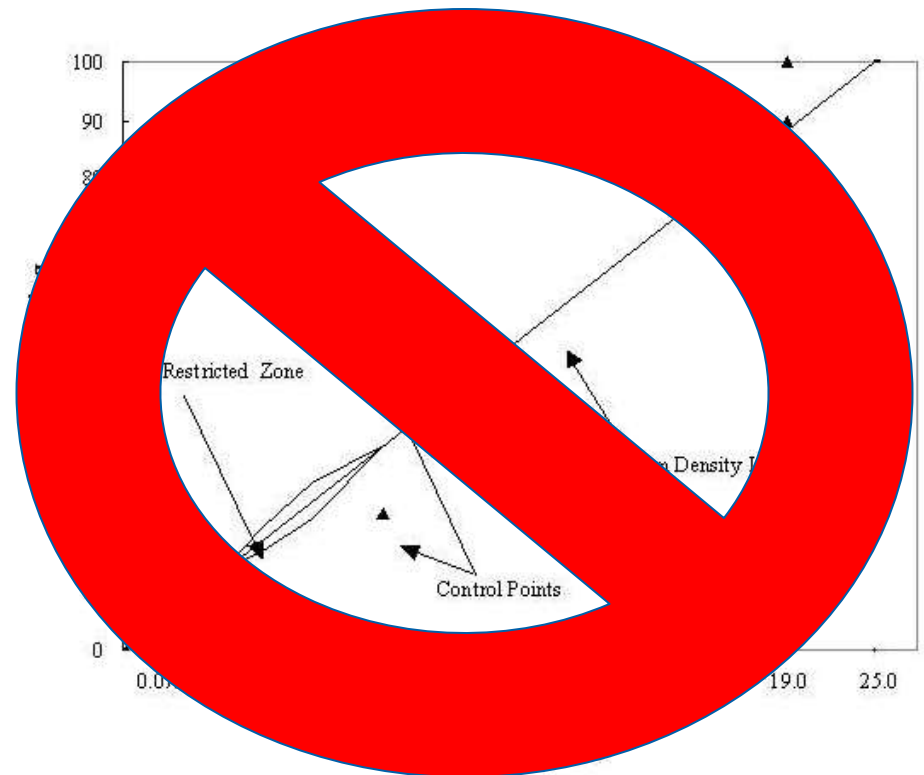
- Over 30 years, VDOT evolved from Marshall to SUPERPAVE Design Procedures
- Progressed from the S-Series, to SM-2 Series to the present SM-9.5/12.5 mixes
- Moved from AC-10/20/30/40 to PG 64-22, 70-22 and 76-22 in 1996/1997
- Full implementation of SUPERPAVE in 2000

INITIAL CHANGES TO NATIONAL SUPERPAVE APPROACH

Removal of gradation restricted zone

Adoption of 1 gyrations level

Elimination of BM-37.5



OTHER MODIFICATIONS SINCE 2000

Permeability requirement for surface mixes

Minimum AC content for BM-25.0A and D

Increase in RAP percentage without binder change

Addition of SM-9.0 and SM-4.75



PERCIEVED UNDERPERFORMANCE OF SUPERPAVE MIXES

- There is a clear perception by both VDOT and Industry leaders that our present Superpave mixes do not have enough liquid asphalt content and, as such, are not lasting as long as they could.
- This perception is supported by some recent data suggesting that our mixes are lasting 1-3 years less than previously determined.
(McGhee/Clark)
- Majority of failures occurring due to age related cracking/fatigue.
- 2010 Research Report by G. W. Maupin “Investigation of Optimized Mixture Design for Superpave Surface Mixtures” recommended additional research on the subject.

TASK FORCE MEMBERS

Kevin McGhee – VCTIR

Todd Rorrer – VDOT

David Lee – VDOT

Rob Crandol – VDOT

Trenton Clark – VAA

Richard Schreck – VAA

Ken Arthur – Templeton Paving

Dickie Mattox – Superior Paving

Brent Moore – Branscome Paving

RESEARCH QUESTION

- Are dense graded mixes designed with SUPERPAVE system providing consistently longer service life compared to previous mixes?
- Criteria for Life
 - Durable or Fatigue resistant
 - Rutting resistant
 - No flushing
 - Skid resistant (surface mixes)
- Research Objective – Maximize the service life of dense graded asphalt mixes



PHASED PROCESS SUPPORTED BY ARAC

Phase I – Superpave Designed Mix Analysis

- **Comparisons**
 - Volumetrics for 50, 65 and Locking Point Gyration
 - Volumetric results for 50 and 75 blow Marshall
- **Mix gradations**
- **Bag samples for future phases**



Phase 1 – Sampled Mixes

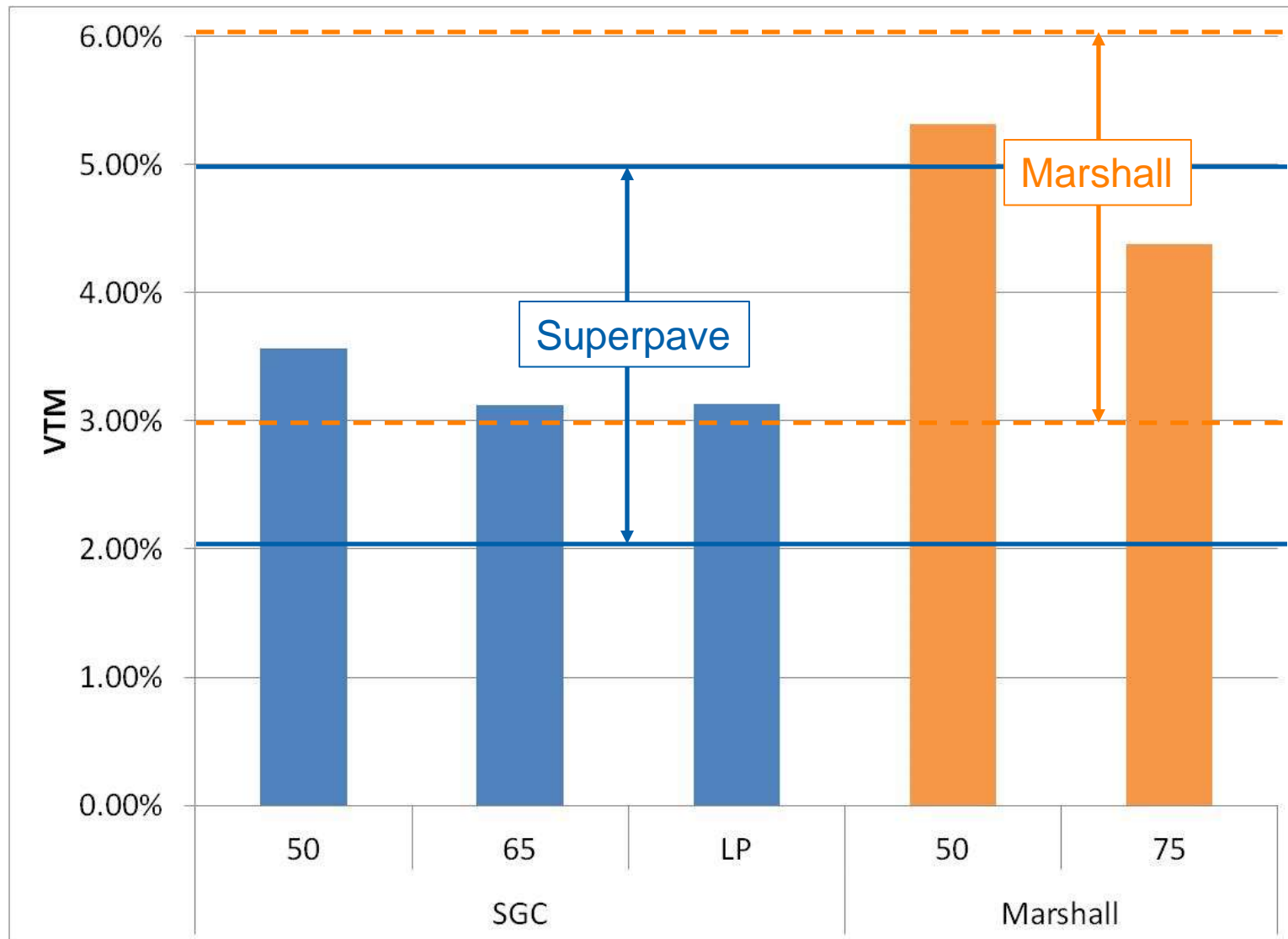
SM – 9.5 Mixes:

- Branscome Deepwater
- Branscome Hampton
- Templeton Mt. Athos
- Superior Stevensburg

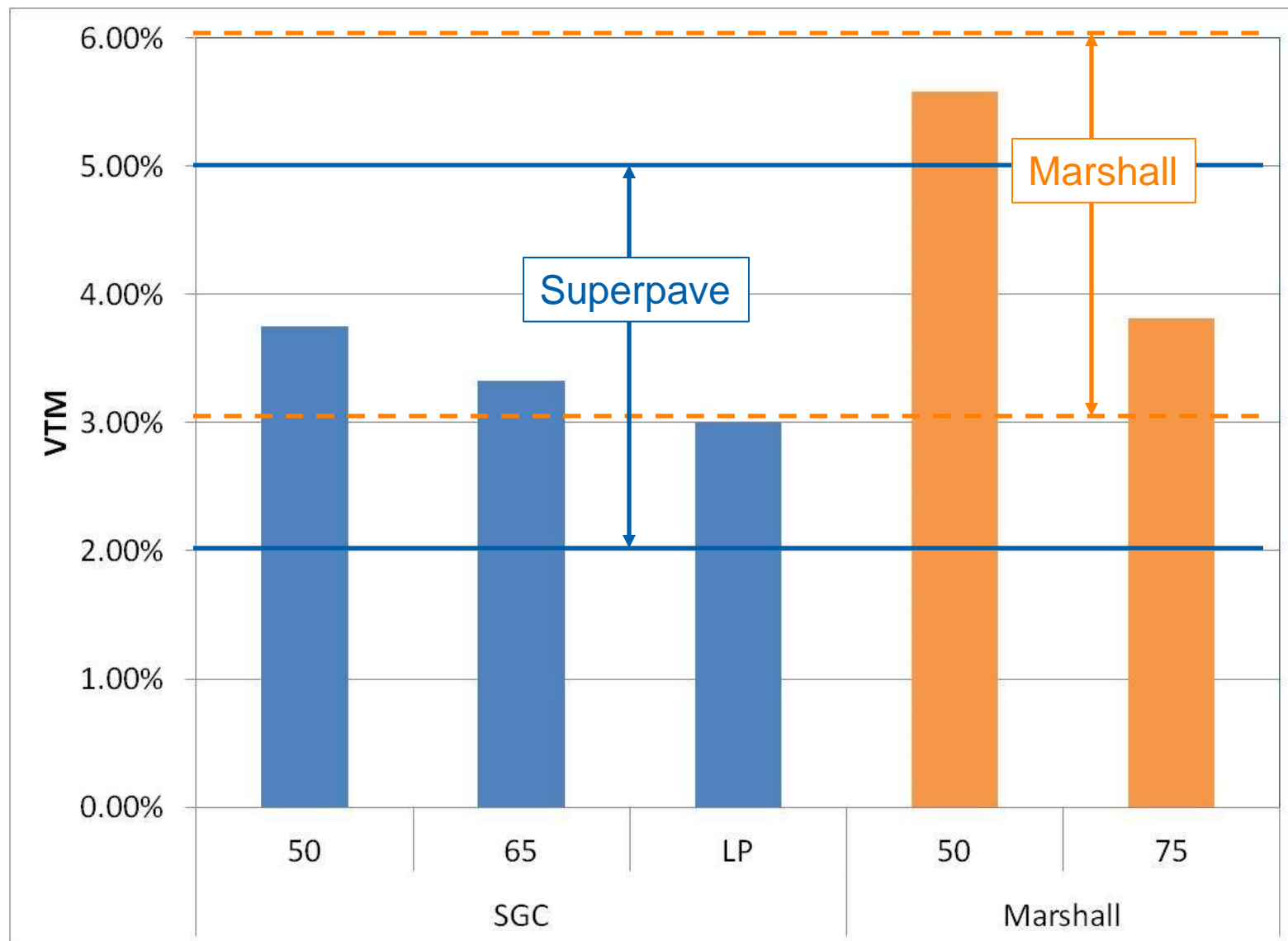
SM 12.5 Mixes:

- LeeHy New Kent
- Branscome Hampton
- Superior Stafford

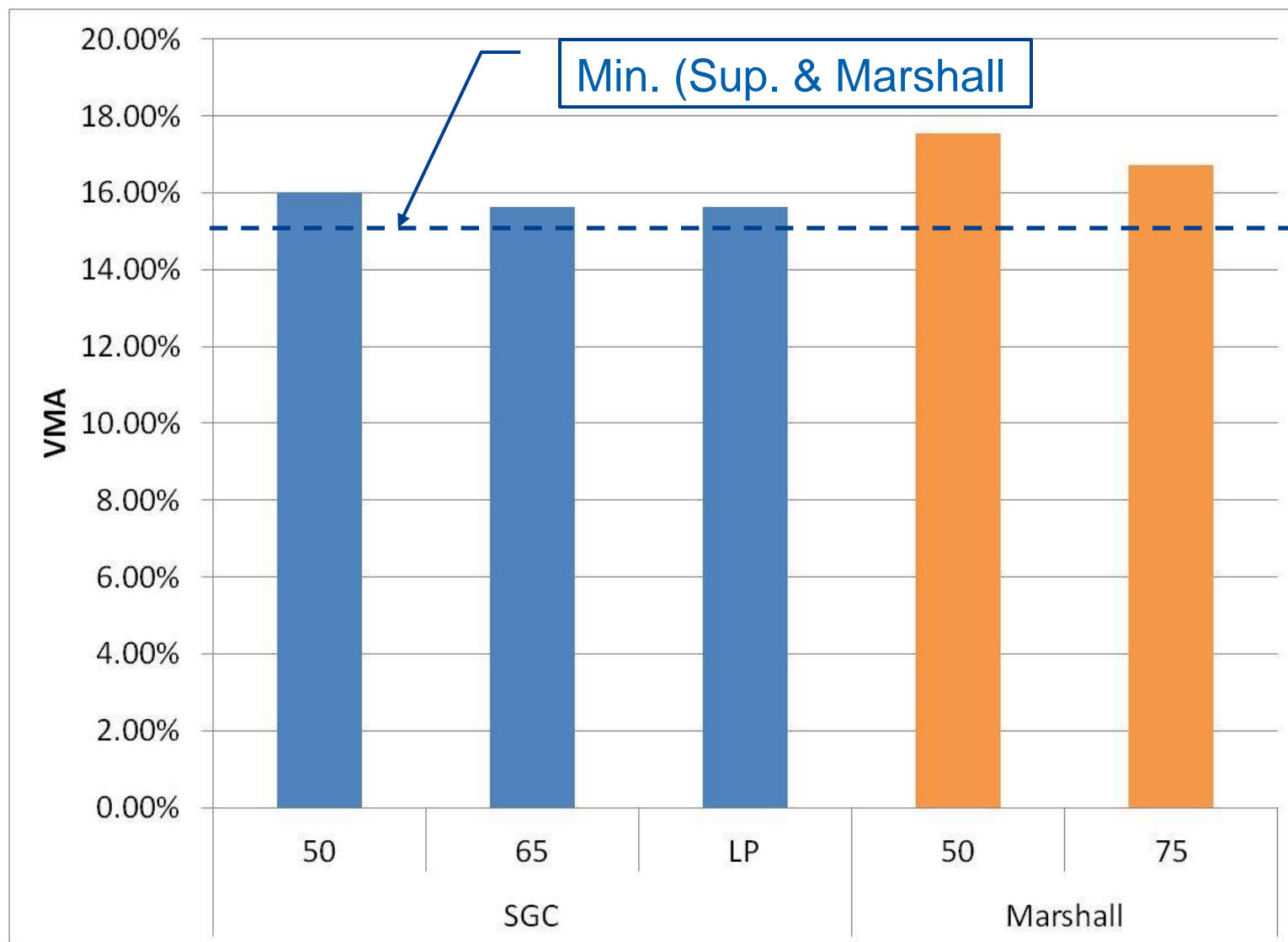
VTM – SM 9.5 Mixes



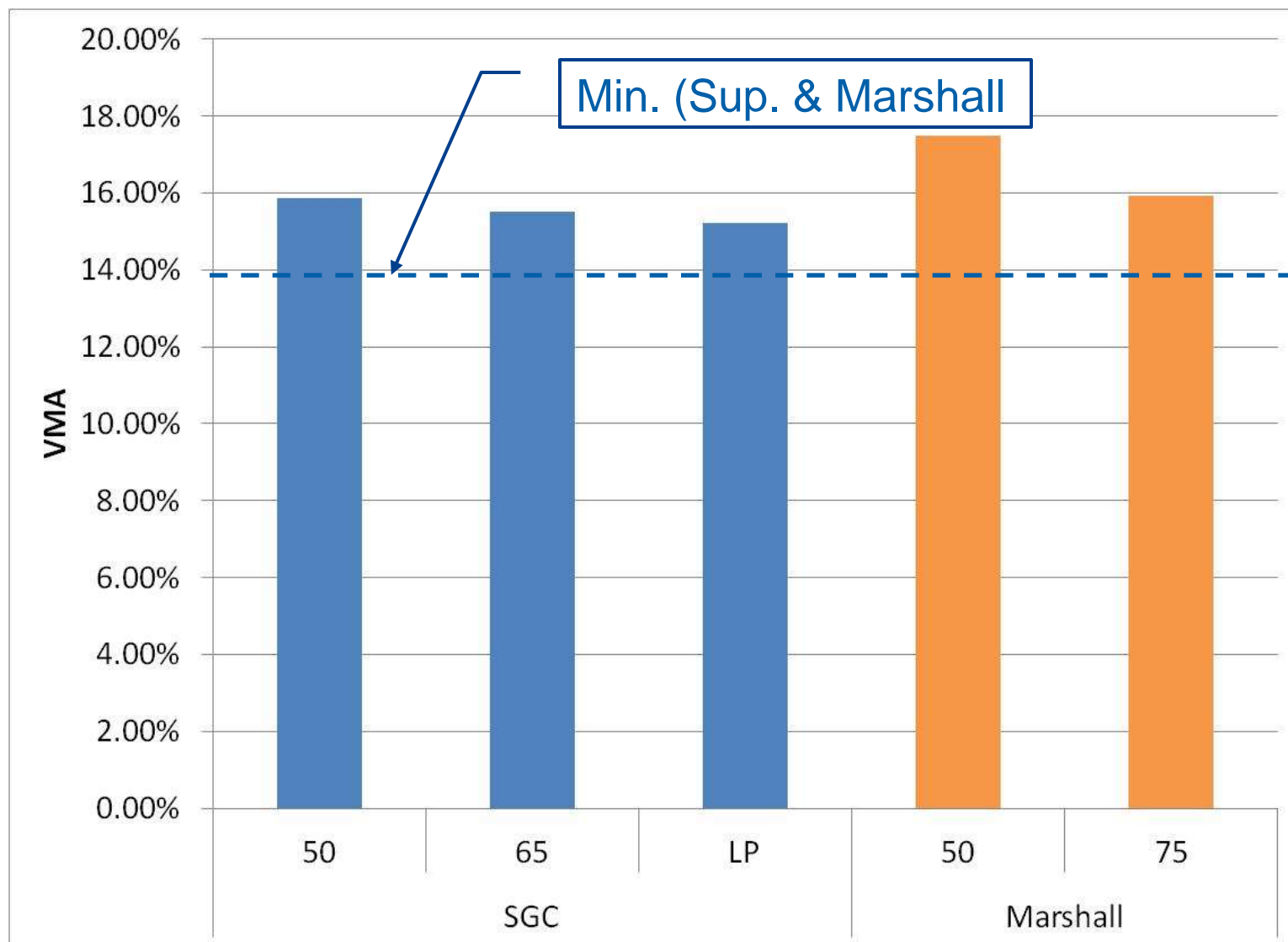
VTM – SM 12.5 Mixes



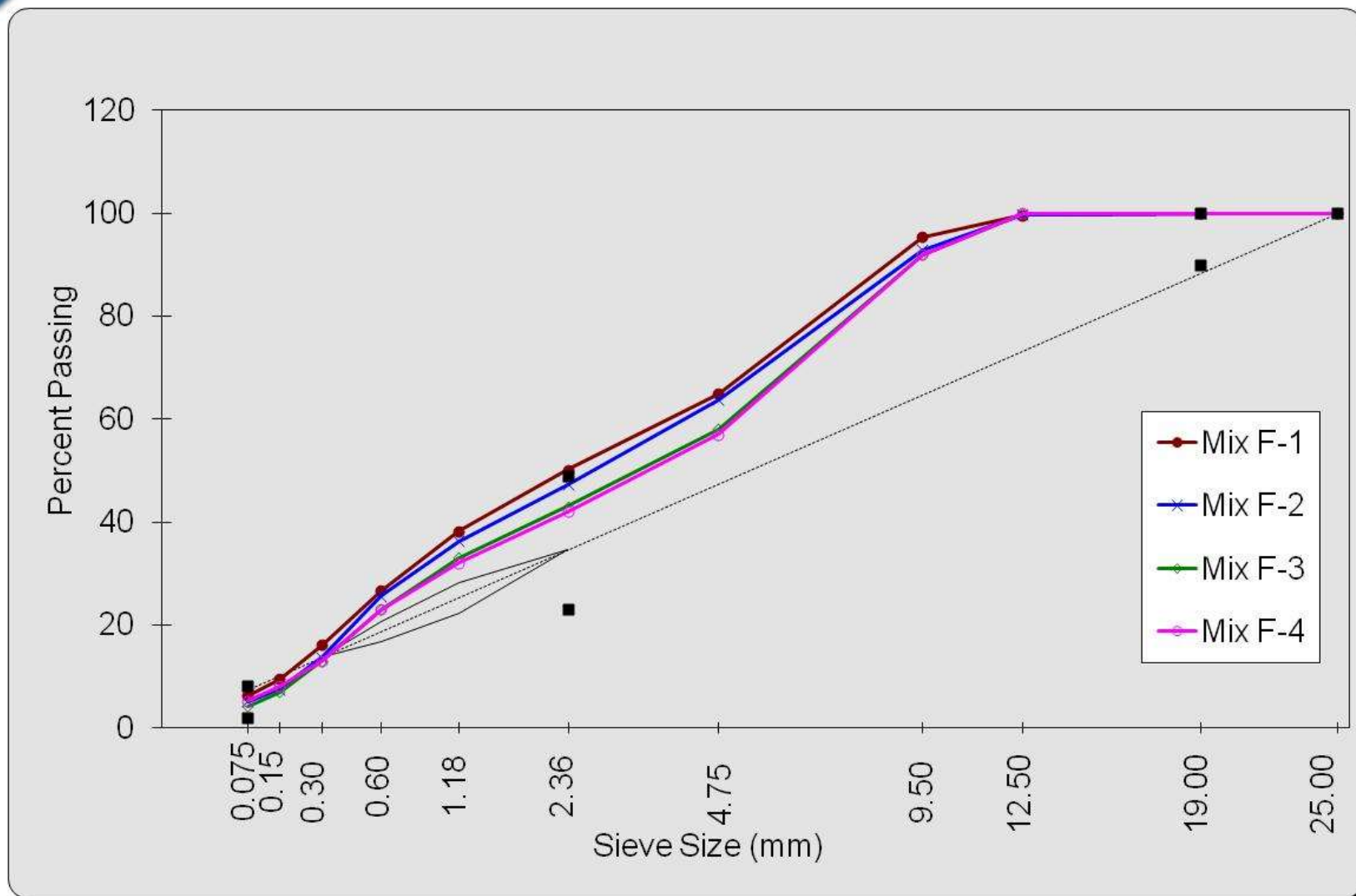
VMA – SM 9.5 Mixes



VMA – SM 12.5 Mixes



SM - 9.5D Gradation



RESULTS FROM PHASE I

- **VTM – Superpave Gyratory (SGC) produces approximately 2% lower VTM than the Marshall hammer.**
- **VMA – SGC produces approximately 1-2% lower VMA than the Marshall hammer.**
- **Review of the data did not produce a definitive “simple solution” (i.e., just reduce the number of gyrations).**
- **Seeking Results of Marshall Gradation in SGC.**

Phase II (Modified) – Marshall Designed Mix Analysis

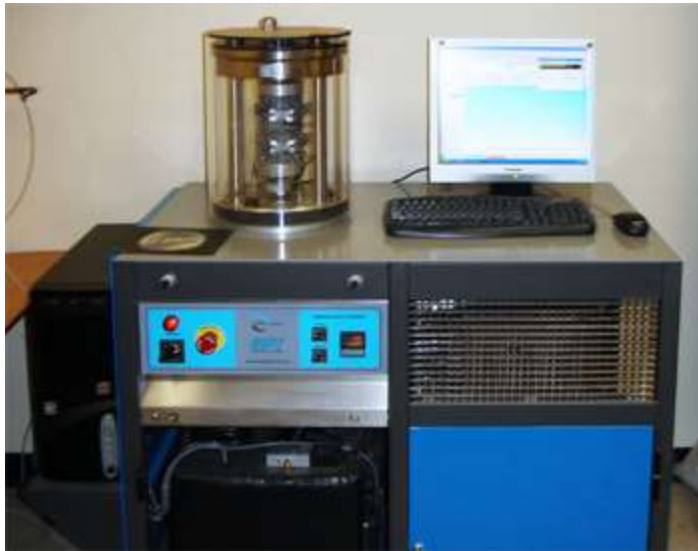
- **Comparisons**
 - Volumetric results for 50 and 75 blow Marshall
 - Volumetrics for 50 and 65 Gyration
- **Mix gradations**
- **Bag samples for future phases**



Phase III – Research Laboratory Testing

Performance Tests (using mixes from Phase I & II)

- APA Rut testing
- Flow Number
- Dynamic Modulus



RESOURCES

- **VAA Contractor members for Phase I & II**
- **VCTIR for Phase III**
- **VDOT/VCTIR/VAA for data analysis during each phase**